FOCUS AREA B: EPIDEMIOLOGY AND SURVEILLANCE

The Department of Public Health (MDPH) has developed a plan for meeting the benchmarks and critical capacities in Focus Areas A, B, C, E and F that will strengthen statewide as well as regional and local public health infrastructure. The plan's intent is to allocate at least 60% of the funding and resources directly or indirectly to the regional and local level. The actual funding level may be higher than 60% if planned regional collaborations are successfully implemented through the establishment of regional consortia. In collaboration with local public health agencies, MDPH proposes to provide funding and resources necessary to facilitate the establishment of collaborative regional structures which include local health agencies which will be described in greater detail under Focus Area A, Critical Capacity #3.2. For preliminary-planning purposes these are referred to as CRLSs or Collaborative Regional and Local Structures.

CRITICAL CAPACITY (1): to rapidly detect a terrorist event through a highly functioning, mandatory reportable disease surveillance system, as evidenced by ongoing timely and complete reporting by providers and laboratories in a jurisdiction, especially of illnesses and conditions possibly resulting from bioterrorism, other infectious disease outbreaks, and other public health threats and emergencies.

1. Prepare a timeline for developing a system to receive and evaluate urgent disease reports from all parts of your state and local public health jurisdictions on a 24-hour per day, 7-day per week basis. (CRITICAL BENCHMARK #8)

Progress Towards Objective

- MDPH staff is available to accept urgent disease reports 24 hours per day/7 day per week. During normal business hours (9a-5p, M-F) this occurs directly through the Division of Epidemiology & Immunization. After hours, a team of epidemiologists and physicians rotate coverage on a weekly basis. Calls are triaged by security personnel at a central location and notification then occurs via a paging system. At the present time, there is no electronic reporting of disease reports. Individual health care providers or local public health agencies submit urgent disease reports.

Proposed Activities to Meet Objective

- The Health Alert Network (HAN), in combination with the NEDSS initiative, will allow for electronic reporting by laboratories, health care providers and local public health agencies. Urgent disease reports or unusual clusters of diseases will trigger a Health Alert to the epidemiologist on-call and appropriate local health authorities.
- MDPH proposes to explore use of a telephone answering service for "after hours' coverage.
- The MDPH State Laboratory Institute (SLI) is developing an Integrated Information System (SLIS). The SLIS will include the use of a patient-based database, electronic reporting and laboratory data interchange using web-based functionality between the Bureau of Communicable Disease Control and other private and government clients. The system will include web-based data entry for hospital and private laboratory sites through a secure data network, using standards and specifications, as they become available through the NEDSS. The electronic interchange of laboratory data will be transmitted in accordance with electronic data interchange (EDI) accepted standards adapted for public health use (e.g., NEDSS, HL7). Logical Observation Identifiers, Names and Codes (LOINC) will be used for test specifications and Systematized Nomenclature of Human and Veterinary Medicine (SNOMED) will be used for test results. SLIS will support the electronic interchange of all required data for notifiable diseases, and surveillance and prevention efforts of the Massachusetts and federal STD Prevention Programs (in collaboration with Focus Areas C and E).

Proposed timeline and evaluation:

- By 7/1/02, an assessment will be done of the current system of coverage.
- By 9/1/02, improvements are made to the 24/7 coverage systems that will ensure that appropriate individuals are notified about incoming calls after hours and on weekends.
- See Focus Area E for timelines and evaluation for HAN and NEDSS-based initiatives.
- By 9/1/02 a SLI pilot system will be in place.

2. Ensure legal authority to require and receive reports on and investigate any suspect cases, potential terrorist events, or unusual illness clusters.

Progress Towards Objective

- At the present time, the MDPH has sufficient statutory and regulatory authority to require and ensure the receipt of reports, investigate suspect cases, potential terrorist events related to health, and unusual illness clusters. This authority includes, but is not limited to M.G.L. c.111, s. 5,6,7, and 105 CMR 300.000.

Proposed Activities to Meet Objective

- The regulations are being updated to require the reporting of emerging diseases, including those that have been identified as posing as biological threat. The regulations will also include stronger language around the role of local and state health authorities to investigate, control and prevent diseases declared dangerous to the public health. In addition, language is being included to formalize direct laboratory reporting to the Department, which allow for increased capacity to identify disease clusters. Public hearings for the new regulations are planned for late in 2002, with promulgation soon thereafter.

Proposed timeline and evaluation:

- By 9/1/02, current draft regulations to include the reporting of all bioterrorist agents and possible clusters of infectious diseases are finalized and sent to public hearing.
- By 12/1/02, above regulations are promulgated.

3. Routinely assess the timeliness and completeness of your reportable disease surveillance system, especially for naturally occurring illnesses and conditions mimicking those resulting from a terrorist action.

Progress Towards Objective

- MDPH currently assesses the timeliness and completeness of reporting for most childhood vaccine preventable diseases, meningococcal disease and Hemolytic Uremic Syndrome (HUS). Parameters for most of the childhood vaccine preventable diseases have been established.
- An active surveillance project was initiated in late 2001 to ensure timely reporting to MDPH of the following organisms by hospital and commercial laboratories: *Bacillus anthracis*, *Brucella sp*. *Cryptosporidium parvum*, *E. coli* O157:H7, *F. tularensis*, *Giardia lamblia*, *H. influenzae*, invasive group A streptococcus, group B streptococcus, *Listeria sp.*, *N. meningitidis*, *Salmonella sp.*, *Shigella sp.*, *S. pneumoniae*, and *Yersinia pestis*.

Proposed Activities to Meet Objective

- Assessments of timeliness and completeness of reporting will be conducted on additional diseases. Protocols will be developed on what constitutes a "complete" report for disease reports under assessment. Protocols will also be developed on what constitutes a "timely" report for diseases under assessment. Reporting will be evaluated using these newly developed standards.

Proposed timeline and evaluation:

- By 7/1/02, five additional reportable diseases will be chosen for assessment.
- By 8/1/02, parameters will be finalized on what constitutes a "timely" report and a "complete" report.
- By 11/1/02, assessments will be completed on these five disease reports.
- By 1/1/03, reports on the timeliness and completeness of these diseases will be available.
- By 1/1/03, a plan will be developed to perform assessments on additional reportable diseases.

4. Ensure the existence of systems to provide ongoing disease surveillance and epidemiology training for public health, clinical, and other healthcare professionals and to develop subject matter expertise within the public health system. **(LINK WITH FOCUS AREA G).**

- Training issues are being addressed in Focus Area G and will include training on new regulations for reporting and isolation and quarantine. See Focus Area G for specific objectives, progress, proposed activities and evaluation regarding education and training issues.

5. With the input of local public health agencies, evaluate and improve the timely and complete reporting of outbreaks of illness and/or key categories of cases of reportable diseases, such as influenza, invasive bacterial diseases, vaccine preventable diseases, vectorborne diseases, and food- and waterborne diseases.

Progress Towards Objective

- MDPH Division of Epidemiology and Immunizations has recently published the *Guide to Surveillance and Reporting* to guide local public health agencies through specific surveillance and reporting responsibilities for the diseases currently reportable to MDPH. Included are all current case report forms and detailed instructions on what, when and how to report. *The Guide* is arranged alphabetically by disease, with each disease in its own chapter. After distribution of the Manual to the state's 351 local public health agencies, trainings were held on the use of *The Guide*.
- MDPH also developed and published in 1997 the Foodborne Illness Investigation and Control Reference Manual to assist local public health agencies in the identification, reporting and investigation of foodborne illnesses.
- As mentioned in the previous objective, MDPH currently assesses the timeliness and completeness of reporting for meningococcal disease, hemolytic uremic syndrome and most childhood vaccine preventable diseases.
- Although influenza is not a reportable disease, MDPH maintains a sentinel surveillance system and a virologic confirmation system.
- The sentinel provider system for influenza has been expanded to a year round system.

Proposed Activities to Meet Objective

- As timeliness and completeness assessments are being done (see previous objective), deficiencies will be identified. Those local public health agencies not meeting the newly developed acceptable standards for timeliness and completeness of reporting will be offered assistance in improving their capacity. Health educators and/or epidemiologists will address these deficiencies and plans will be developed for improvement based on the particular situation.
- The year-round sentinel provider system for influenza will be enhanced.
- MDPH will institute laboratory-based influenza surveillance to include viral isolates and the results of rapid tests for influenza.

Proposed timeline and evaluation:

- By 1/1/03, reports on the timeliness and completeness of the reportable diseases under assessment (see previous objective) will be available and distributed to local public health agencies in a pre-determined format.
- By 1/1/03, local public health agencies with difficulty meeting "timeliness" and "completeness" criteria will be approached about effecting improvements and resources will be made available to accomplish that goal.
- By 8/1/03, year round influenza surveillance and laboratory reporting will be established.

6. Assess capacities associated with monitoring dermatological conditions/rash illnesses and develop plans to improve this component of the surveillance system.

Progress Towards Objective

- The Massachusetts Immunization Program currently does rash surveillance for measles, rubella and varicella. Current surveillance for rash illness includes:
    - All suspect cases of rash illness are routinely investigated within 24 hours.
    - All suspect and confirmed cases of measles and rubella are closely followed to determine susceptible contacts and to make recommendations for control and prevention of disease.
    - Specimens from patients with maculopapular rashes are routinely requested to be sent to the SLI for testing (IgM and IgG for measles, rubella and parvovirus).
    - Varicella is a reportable disease in Massachusetts in aggregate by schools, health care providers and local public health agencies. Unusual presentations of varicella, large numbers of cases, or cases in high-risk settings are also reported and promptly investigated. We currently do not have the capacity to do laboratory testing for varicella.

Proposed Activities to Meet Objective

- Expand and enhance rash illness surveillance to include:
    - Surveillance for vesicular rash illness
    - Surveillance for rash illness due to potential BT agents
- Enhance laboratory reporting of infectious agents known to cause rash illness.
- Enhance collaboration with infectious disease and dermatological clinicians.
- Provide education on identifying rash illnesses that might be due to BT agents, including smallpox, anthrax, hemorrhagic fevers, etc.
- Encourage reporting of rash illness.

- Enhance collaboration on syndromic surveillance project with Harvard Vanguard/Harvard Pilgrim to include expanded dermatological data (see Enhanced Capacity, Activity #1)
- Expand laboratory capacity to include further testing for varicella, anthrax and smallpox (see section C, Laboratory Capacity-Biologic Agents).

Proposed timeline and evaluation:

- By 9/1/2002, an epidemiologist will be hired for rash illness surveillance.
- By 1/2002, will identify surveillance partners, including specialists in infectious disease, dermatology and laboratory sciences.
- By 5/2003, a preliminary list of sites to begin sentinel surveillance for rash illness/dermatologic lesions will be developed.
- By 8/2003, laboratory standards for diagnostic testing for varicella will be developed.
- By 8/2003, a draft protocol for evaluating and reporting rash illness will be developed.

7a. Ensure sufficient epidemiologic staffing capacity to manage the reportable disease system at the state and local level.

Progress toward Objective

- At the state level, epidemiologic capacity has been increased in recent years as a result of the Epidemiology and Laboratory Capacity cooperative agreement and the present BT Preparedness cooperative agreement. To keep up present staffing levels, which are sufficient to handle the prevention, control and investigation of most naturally occurring communicable diseases, all personnel presently supported on the current cooperative agreement will continue to be supported.
- Public health nurses perform most epidemiologic response at the local level in Massachusetts and many local public health agencies have allocated sufficient resources to manage such a response adequately.

Proposed Activities to Meet Objective

- A bioterrorist event would overwhelm even the most prepared state or local public health agency. In Massachusetts there are over 300 local health agencies with varying levels of resources and population. Response to infectious disease emergencies could benefit from mutual assistance arrangements, similar to those in effect for fire departments, wherein assistance is requested of neighboring communities when large fires or disasters occur. The exact direction this will take will depend on the results of the regional planning process (see Focus Area A, Part II, #2) and the recommendations that are made regarding regional needs. One possibility is through locally established Collaborative Regional and Local Structures, currently being proposed by local public health agencies. The MDPH will make funds available to assist in the implementation of regional plans as they pertain to epidemiologic capacity and need.

Proposed timeline and evaluation:

- Present staffing levels are maintained at the state level.
- By 10/1/02 a plan is developed to ensure that regional epidemiologic needs are met based on the results of the regional planning process (see Focus Area A, Part II, #2).
- By 1/1/03 the plan to provide appropriate epidemiologic coverage regionally is implemented.

7b. Ensure the competence of that staff by providing the necessary supplies, equipment, and training in epidemiology, surveillance, and interpretation of clinical and laboratory information. (LINK WITH FOCUS AREA G)

Progress toward Objective

- Current staff, including those funded from the current BT cooperative agreement, have access to training opportunities and are supplied with necessary supplies and computer equipment to fulfill their duties.
- Currently there are staff epidemiologists with laboratory experience who provide training on the interpretation of clinical and laboratory information.

Proposed Activities to Meet Objective

- On-going training of existing and new staff. In addition, computer hardware and software will be provided to new staff and existing staff will have on-going needs met.
- The training needs of local public health agencies are being addressed in Focus Area G as well as specialized training needs of MDPH staff.
- Equipment needs of local public health agencies are being addressed in Focus Area E.

- Evaluations of current space requirements will occur for existing and new staff and appropriate renovations proposed.

Proposed timeline and evaluation:

- By 7/1/02 a thorough assessment is made on the space and equipment needs of MDPH staff.
- By 9/1/02, plans are finalized on the required renovations to house staff adequately.
- By 9/1/02, appropriate equipment has been supplied to Department staff.
- See Focus Area G for timelines and evaluations for training and education needs and initiatives for MDPH and local public health agencies.

FOCUS AREA B: EPIDEMIOLOGY AND SURVEILLANCE

CRITICAL CAPACITY (2): to rapidly and effectively investigate and respond to a potential terrorist event as evidenced by a comprehensive and exercised epidemiologic response plan that addresses surge capacity, delivery of mass prophylaxis and immunizations, and pre-event development of specific epidemiologic investigation and response needs.

1. Assess current epidemiologic capacity and prepare a timeline for achieving the goal of providing at least one epidemiologist for each Metropolitan Statistical Area (MSA)with a population greater than 500,000 *(CRITICAL BENCHMARK #9).*

Progress Towards Objective

- Massachusetts has a population of approximately six million people but only one MSA. With the additional staffing that is proposed under Focus Area B, Critical Capacity (1), MDPH will have sufficient capacity to provide one epidemiologist for every 500,000 citizens across the state. Currently, epidemiologic capacity is centralized. Massachusetts does not have a county health department system. Massachusetts, however, is a relatively small state, geographically, with every area not more than a 2.5-hour drive from the central office, located in Boston. In addition, many local public health agencies have public health nurses to perform many epidemiologic response activities for their local jurisdiction.

Proposed Activities to Meet Objective

- Discussions will be held with local public health agencies to determine if epidemiologic resources should be more readily available on a regional basis and what those regions would look like. What form those resources would take, e.g. public health nurse, epidemiologist, etc. would also be discussed and likely depend on the particular needs of a region. This will be done in coordination with the regional panning process proposed in Focus Area A, Section II, part 2. Funding will be provided to address the epidemiologic needs of all local health jurisdictions based on results of that planning process as proposed in Focus Area B, critical capacity #1.

Proposed timeline and evaluation:

- By 7/1/02 convene an Epi/Surveillance Local Public Health Working Group with representation from regional health officers, MAHB, MHOA and the MAPHN.
- By 9/1/02, be able to list and prioritize regional Epidemiology/Surveillance needs.
- By 12/01/02, problem solve and/or award funding for local public health agencies to hire staff to address identified deficiencies.

2. Ensure that a full-time response coordinator for bioterrorism, other infectious disease outbreaks, and other public health threats and emergencies has been designated at the appropriate state and/or local levels.

Progress Towards Objective

- A Bioterrorism Program Coordinator for the MDPH Bureau of Communicable Disease Control has been funded through the existing cooperative agreement since 1999. The responsibilities of this position have been to coordinate BT activities with existing infrastructure for surveillance and epidemiology program activities and other CDC programs and also to assist the state response coordinator.

Proposed Activities to Meet Objective

- The MDPH will hire a full-time emergency preparedness coordinator (see Focus Area A, Section 2, Critical Capacity #3).

Proposed timeline and evaluation:

- See Focus Area A, Section 2, Critical Capacity #3 for timelines regarding the hiring and duties of the emergency preparedness coordinator.

3. With local public health agencies, coordinate all epidemiologic response-specific planning in this section with your jurisdiction's overall planning conducted in Focus Area A, and with hospital preparedness activities being facilitated by the Health Resources Services Administration.

Progress Towards Objective

- Meetings have been held with representatives of local public health agencies regarding various BT related response issues including epidemiologic response concerns.
- Assessments of local public health response capacity is planned (see Focus Area A, Section I, critical capacity #2) which will include epidemiologic response capabilities of local public health agencies.

Proposed Activities to Meet Objective

- Epidemiologic response related deficiencies or needs of local public health agencies identified in the assessments mentioned above will be addressed through a coordinated statewide approach with extensive input of local pubic health agency planning groups.
- Epidemiologic response plans that address specific situations such as BT events or other public health emergencies such as large foodborne outbreaks, meningococcal disease or hepatitis A in foodworkers will be developed with input from partners including local public health agencies, public health nurses, hospitals, community health centers and other local health care providers..
- In coordination with local public health agencies, MEMA and other state agencies, MDPH will participate in statewide preparedness exercises (see Focus Area A for objectives and timelines for this activity).

4. Train state and local public health staff who would respond to a bioterrorism event in their roles and in the specifics of your jurisdiction's plan. (LINK WITH FOCUS AREA G)
   - All training and education of state and local public health agency staff is being addressed in Focus Area G.

5. Ensure the performance of risk and vulnerability assessments of food and water to include assessments of production, processing, and/or distribution facilities.

Progress Towards Objective

- In Massachusetts, food production, processing and distribution safety is ensured by the MDPH's Division of Food and Drugs (DFD) through federal and state regulations, policies and guidelines overseeing food processing, retail sale, bottled water, dairy processing and seafood processing (M.G.L c. 94 , s. 1-196, 304-306); and by the Department of Food and Agriculture's (DFA) enforcement of federal and state food production regulations.
- MDPH has a working group on foodborne illness control (WGFIC) to respond to foodborne disease incidents and outbreaks. The WGFIC consists of representatives from the DFD, the Division of Epidemiology and Immunization, and the Division of Diagnostic Laboratories and meets bi-monthly to discuss foodborne related activities and responses. The WGFIC also has local representation from time to time based on events that are occurring statewide. A representative from the Boston Public Health Commission is a regular attendee at WGFIC meetings.
- DFA has 5 inspectors to investigate all dairy and milk processing facilities, all livestock and poultry farms, pet shops, and transportation facilities and 4 weekly livestock auctions in Massachusetts
- The Department of Public Health's DFD has 10 inspectors to inspect 2,200 wholesale and retail facilities and to assist the 351 jurisdictions in the prevention and investigation of food borne illnesses.
- The Massachusetts Water Resource Authority (MWRA) currently provides about 250 million gallons of water each day to 46 cities and towns in Massachusetts. Thirty of these communities are fully supplied by MWRA water with the remaining communities using MWRA water to augment their own supplies, either on a regular basis or in times of water shortage. More than two million people are served by the MWRA system. MWRA has taken a range of actions to protect its water supply from physical security measures, emergency planning and training, and testing and monitoring. Almost the entire MWRA and community water systems are located underground in tunnels, covered storage tanks and pipelines. Access is extremely limited and protected. MWRA has redundant tunnels and pipes, as well as backup water supplies, and regularly trains staff on emergency response actions. The State Police, locks and alarms, MWRA staff, and video surveillance currently protect critical areas. MWRA closely watches water chemistry in the metro Boston area distribution network while community water departments conduct weekly testing.
- The Environmental Protection Agency (EPA) is providing funds for vulnerability assessments for water supplies serving over 100,000 people. For water supplies between 10,000 and 100,000 people, EPA is providing training and checklists so that those water suppliers can do their own vulnerability assessment. EPA is also providing funds to the Department of Environmental Protection (DEP) drinking water program to implement for Massachusetts's water suppliers the vulnerability assessment, training, and other needs.
- MassGIS is working on developing statewide GIS database that features a number of parameters relevant for emergency response planning to bioterrorism events, including locations of water bodies that serve as sources of public drinking water supplies, chemical user facilities, large populations that need to be evacuated, and vulnerable emergency response facilities. However, there are no known complete GIS databases providing details on the distribution systems of public water supplies throughout Massachusetts.
- Historically and currently, MDPH has been and is working collaboratively with DEP to determine the safety of public drinking water supplies.
- With regard to water quality, DEP is required to report to DPH any violations of DEP regulations related to drinking water quality standards and based on that report or upon its own investigation, DPH may order the appropriate party to cease violating the water quality standards and take whatever steps are necessary to purify the water. If any such order of DPH conflicts with any order of DEP, the order of DPH takes precedence.

Proposed Activities to Meet Objective

- Provide interagency funding to hire biosecurity activities coordinators for both DFA and the DFD and the necessary regionally field staff in each department to conduct vulnerability assessments of all farms and food production, processing and distribution facilities and to provide technical support, training and assistance to the local health agencies to improve trace-back systems and food code enforcement.
- Provide interagency funding for equipment needed to develop databases and communication networks to quickly and effectively investigate illnesses within livestock for biohazard risk. This equipment would include GIS equipment for mapping of farm locations and veterinary practices, communication and computer equipment for developing a coordinated response system integrated with the Health Alert Network.
- Provide funding to amend existing regulations and develop new statutes to improve the regulatory foundation for emergency response to biohazards.
- All training issues are being addressed in Focus Area G and will include trainings of large animal veterinarians in identifying and properly reporting zoonotic diseases and other sentinel health events related to livestock and other farm animals. Trainings will also include directed activities towards educating food producers, local health agencies and animal inspectors in risk and vulnerability assessment of the food supply.
- Provide funding for DPH/DEP for review of the vulnerability assessments and work local boards of health, water suppliers, and others to ensure that the response plan takes into account the local conditions.
- DPH would prepare in collaboration with DEP and local boards of health risk communication documents associated with health concerns resulting from bioterrorism events.
- DPH would review new methods or provide technical assistance for decontamination procedures and health concerns associated with these decontamination procedures following a bioterrorism event.
- DPH would work with DEP, MWRA, boards of health, and local water suppliers to develop criteria for re-opening bioterrorism-contaminated water supplies. In addition to that, develop communication protocol for accomplishing re-opening.
- DPH would propose to create GIS maps of all Massachusetts public water supplies for disease prevention and intervention in response to a BT event. For example, the maps should depict details of the water distribution system such that populations can be identified that are most impacted and intervention can be focused on the most vulnerable population as quickly as possible.

Proposed timeline and evaluation:

- By 7/1/02, provide funding to the DFA and DFD to recruit biosafety activities coordinators.
- By 7/1/02, provide funding to the DFA to assess need and purchase veterinary medical equipment needed to quickly and effectively investigate illnesses within livestock for biohazard risk.
- By 8/1/02, provide funding to DFA and DFD for communication and computer equipment for developing a rapid coordinated response system and integrating with the health alert network.
- By 8/1/02, provide funding to DFA and DFD to amend existing regulations and develop new statutes to improve the regulatory foundation for emergency response to biohazards in the food supply.
- By 8/1/02, provide funding to conduct vulnerability assessments of all food production and processing facilities.
- By 10/1/02, using information from the vulnerability assessment, work with local health agencies to develop plan of action to improve trace-back systems and enhance food code enforcement to reduce potential risks from the food distribution and production system.
- By 3/1/03, take actions to implement improvements to trace-back systems and food code enforcement.
- By 7/1/03, complete review of vulnerability assessments of water systems serving populations greater than 100,000are reviewed and health risk communication materials are prepared.
- By 7/1/03 progress is made toward completing GIS maps of Massachusetts public water supplies.
- By 12/1/03, a draft is completed with criteria for re-opening BT-contaminated water supplies and review of new methods for decontamination procedures and health concerns.

FOCUS AREA B: EPIDEMIOLOGY AND SURVEILLANCE

CRITICAL CAPACITY (3): to rapidly and effectively investigate and respond to a potential terrorist event, as evidenced by ongoing effective state and local response to naturally occurring individual cases of urgent public health importance, outbreaks of disease, and emergency public health interventions such as emergency chemoprophylaxis or immunization activities.

1. Achieve an around-the-clock capacity for immediate response to reports of urgent cases, outbreaks, or other public health emergencies, including any events that suggest intentional release of a biologic agent.

Progress Towards Objective

- MDPH staff is available to accept urgent disease reports 24 hours per day/7 day per week through the Division of Epidemiology & Immunization. During normal business hours (9a-5p, M-F) this occurs through the Division of Epidemiology & Immunization. After hours, a team of epidemiologists and physicians rotate coverage on a weekly basis. Calls are triaged by security personnel at a central location and notification then occurs via a paging system.

Proposed Activities to Meet Objective

- The Health Alert Network (HAN) in combination with NEDSS initiative will allow for electronic reporting and case management of diseases by laboratories, health care providers and local public health agencies. Urgent disease reports or unusual clusters of diseases will trigger an automatic Health Alert to the epidemiologist on-call and appropriate local health authorities. Veterinarians and veterinary practices will also be included in the HAN to allow for appropriate zoonotic disease reporting.

Proposed timeline and evaluation:

- See Focus Area E for timelines and evaluations of the HAN and its capabilities.

2. Assess the adequacy of state and local public health response to outbreaks of disease and other public health emergencies.

Progress Towards Objective

- Epidemiologic capacity on the state level to respond to situations described above is being adequately met through this cooperative agreement over the past three funding years and other long-standing cooperative agreements addressing epidemiologic capacity. In the past year alone, two situations involving hepatitis A in foodhandlers demanded an expansive response requiring the administration of over 1600 doses of immune globulin in each case.
- Local health response, however, is varied. Massachusetts's local health is not delivered through a county structure. MDPH acts collaboratively with local public health agencies for many jurisdictions for epidemiologic functions. In most cases, epidemiologic response that is handled at the local level is done so through public health nurses. In the abovementioned hepatitis A situation the local public health response was collaborative among jurisdictions. The response was planned and orderly with resources supplied by a number of local public health jurisdictions, local public health nurses, school nurses and the local hospital.
- The Department of Justice survey was carried out over the past two years to help assess the local capacity for response. Out of necessity all local public health agencies could not be assessed but out of approximately 110 approached, 97 participated.

Proposed Activities to Meet Objective

- MDPH will facilitate a comprehensive statewide assessment of response capabilities related to BT, other infectious disease outbreaks, and other public health emergencies of all 351 local health jurisdictions (see Focus Area A, Section I, critical capacity #2 for specific activities regarding this objective).

Proposed timeline and evaluation:

- See Focus Area A for timelines and evaluations on the needs assessments of local health jurisdictions.

3. Assess and strengthen links with animal surveillance systems and the animal health community.

Progress Towards Objective

- With oversight by the Department of Food and Agriculture, many of the 351 towns in Massachusetts have town-appointed animal inspectors which have played critical roles in rabies prevention, West Nile virus control strategies and pet store interventions, particularly in regard to the zoonotic disease, psittacosis. Not every town appoints an inspector as required by law and none of the inspectors have received training on zoonotic diseases that could potentially be used as BT agents.
- In 1992 a rabies advisory committee with representation from DPH, DFA, USDA, Tufts Veterinary School, MSPCA, the Massachusetts Veterinary Medical Association (MVMA), and the Animal Control Officers Association was formed to help shape the rabies response plan for Massachusetts.

- As a result of the Rabies Advisory Committee, statutory changes were made to strengthen the state's rabies control plan and compulsory rabies vaccination of dogs and cats.
- In 1993 a hugely successful wildlife rabies vaccination project was initiated through the collaboration of DPH, Tufts Veterinary School, CDC, USDA and DFA. By annually vaccinating a large number of raccoons, a barrier has been created to prevent the spread of rabies to Cape Cod.
- In conjunction with the MDPH, MEMA and other state agencies, the Department of Food and Agriculture has developed an emergency response plan for highly contagious diseases (e.g. foot and mouth) in animals. There are plans to test the emergency response plan for deficiencies.

Proposed Activities to Meet Objective

- The development of a veterinary advisory committee including representation from DFA, Tufts Veterinary School, the various in-state veterinary technician training programs, MVMA, Animal Control Officers Association and private and public veterinary diagnostic laboratories to guide the development and enhancement of animal surveillance programs.
- Funding to provide an epidemiologic coordinator for veterinary surveillance activities and plan development within the Bureau of Animal Health, DFA.
- Funding to provide computer resources in the Bureau of Animal Health for tracking disease occurrences and linkage to the HAN.
- Funding to assist with a 24/7 animal event reporting system
- Funding to assist with addressing deficiencies in the Emergency Response Plan for Highly Contagious Diseases of Animals.
- All training issues are being addressed in Focus Area G and will include the training of veterinarians, veterinary technicians and animal inspectors in BT topics and response.

Proposed timeline and evaluation:

- By 7/1/02, provide funding to DFA to hire an epidemiologic surveillance project coordinator.
- By 8/1/02, convene the first meeting of the veterinary advisory committee.
- By 8/1/02, provide funding to DFA to provide computer resources.
- By 9/1/02 develop strategic plan for insuring 24/7 animal event coverage.

4a. With local public health agencies, ensure sufficient staff to respond to urgent cases, disease outbreaks, and public health emergency interventions at the state and local level.

Progress Towards Objective

- With over 300 local public health jurisdictions it would be difficult to ensure sufficient staff to respond to urgent cases, disease outbreaks, and public health emergencies absent a regional approach. For this reason, much epidemiologic capacity has been centralized at the state level. Staff is available 24/7 to assist local public health agencies in their response activities. In most cases, this involves working with public health nurses, who provide most of the epidemiologic response capacity at the local level. In addition, Massachusetts is a relatively small state with all areas reachable within 2-3 hours. Through this cooperative agreement and other cooperative agreements staff at the state level has proved adequate to respond to most situations, absent a large-scale bioterrorist event.
- Some local public health agencies do have sufficient staff, mainly in the form of public health nurses, to respond to urgent cases, disease outbreaks and public health interventions at the local level.

Proposed Activities to Meet Objective

- Discussions will be held with local public health agencies to determine how response resources can be more available on a regional basis, and what those regions would look like. What form those resources would take, e.g. public health nurse, epidemiologist, etc. would also be discussed and likely depend on the particular needs of a region. It would be impossible to place staff in each of the 351 separate health jurisdictions, as one approach that could be explored would be staff shared among groups of local jurisdictions that could then coordinate a response to a public health emergency such as a large foodborne outbreak or a case of hepatitis A in a foodworker that may require large-scale administration of immune globulin. Such staff could also function as trainers or health educators when not responding to outbreaks. This would be developed based on the results of the needs assessment and development of a more regional approach on infectious disease issues. Through Focus Area A activities, the option of regionalizing the local public health system will be explored.
- Existing staff in local public health agencies and any additional staff will be supplied with appropriate tools, training and equipment.
- Funding will be available to provide local public health agencies with the tools that they may require to be better prepared to respond to emergency situations.

Proposed timeline and evaluation: (this is also addressed in Critical Capacity #2)

- By 7/1/02 convene an Epidemiology/Surveillance Local Public Health Working Group with representation from, MAHB,

MHOA, MAPHN, and other organizations representative of local public health.

- By 9/1/02, be able to list and prioritize regional Epi/Surveillance needs.
- By 12/01/02, problem solve and/or award funding for local public health agencies to hire staff to address identified deficiencies.
- See Focus Area A, Section II, Critical Capacity #3 for timelines regarding the regional planning process.

FOCUS AREA B: EPIDEMIOLOGY AND SURVEILLANCE

ENHANCED CAPACITY: to rapidly detect and obtain additional information about bioterrorism, other infectious disease outbreaks, or other public health threats or emergencies by accessing potentially relevant pre-existing data sets outside the health department, or through the development of new active or sentinel surveillance activities.

Activity #1:

The continued development and evaluation of syndromic surveillance for the early detection of BT events using an HMO's electronic medical record and pharmacy information system data (currently in second full year of current cooperative agreement).

Objective:

- To maintain and extend the current Harvard Vanguard/Harvard Pilgrim real time surveillance system for detection of clusters of acute illness due to bioterrorism and other causes in Eastern Massachusetts.
  - The maintenance and development of the existing daily reporting system that uses internet based graphical and statistical methods for reporting the frequency of eight syndromes of public health interest will be continued. In addition there will be specific notice of assigned diagnosis codes suggesting CDC Category A BT agents.
  - NEDSS compliant reports, to the extent the standards are available, applicable, and desired by the MDPH will be developed.
  - Better signal detection methods for a wide range of illnesses will be developed with the input of the MDPH. This work will address the different expected presentations of various syndromes, e.g., geographically and temporally localized spikes for suspected bioterrorism, versus more dispersed increases for selected respiratory or water borne illnesses.
  - Methods will be developed for generating simulated data to assess whether our techniques will identify various types of bioterrorism or natural disease events.
  - Alternative statistical methods and simulation tools to help provide early warnings of BT attacks and other acute health events will also be developed.

Investigators at the Harvard Medical School Department of Ambulatory Care and Prevention (DACP) have developed a real-time automated system that reports daily visits for general symptoms among approximately 10% of the residents of a region of eastern Massachusetts. The intended use of the reporting system is to identify possible BT events and more generally clusters of acute illness in the greater Boston area. The data source is ambulatory visits and telephone calls by Harvard Vanguard Medical Associates (HVMA) patients who are members of Harvard Pilgrim Health Care (HPHC). This system has worked well since it was activated in October 2001. Current operations will be maintained and extended in the following ways:

- Update the existing longitudinal database to include 2002 encounter and membership data and refit existing prediction models. Information about HVMA's Blue Cross/Blue Shield and Tufts Health Plan prepaid members (expected to be approximately 100,000 additional individuals), will be obtained, if access to their membership information is available.
- Modify existing reports to make them NEDSS compatible, if this is feasible and desired by the MDPH.
- Integrate reports of events that exceed pre-set thresholds into existing public health emergency notification systems to ensure timely delivery of this information to the appropriate individuals.
- Develop specific signal detection methods tailored to different syndrome presentations, e.g., geographically and temporally localized spikes for suspected bioterrorism, versus more dispersed increases for selected respiratory or water borne illnesses.
- Develop syndrome-specific thresholds for alerting public health personnel of events that merit unusual attention.
- Test the performance of these signal detection methods and thresholds through simulation methods.

Using current funding, a model to identify unusual temporo-spatial clusters that may be an early indicator of a BT event has been developed. The model, based on Generalized Linear Mixed Model theory, can detect a very localized occurrence of bioterrorism: even two or three additional cases in a neighborhood will likely cause suspicion of unnatural illness. In addition, the model easily accommodates temporal clustering, secular and seasonal trends and are adjusted for the size of the population residing in each region.

The objective of the proposed project is to meet the following most pressing needs:

- The current model is most sensitive to an event that raises the number of contacts in a locality. We have planned a three-pronged system that will also be sensitive to small increases in contacts spread out over the whole area as well as to an increased level of clustering that does not increase the overall or local number of visits.
- There are still other statistical approaches to our data that could be made suitable for bioterrorism surveillance with minimal adjustment. For example, the spatio-temporal scan statistic might be an alternative approach. These adjustments should be made and the relative strengths and weaknesses of the techniques must be explored.
- The current model requires running a relatively complex and time-consuming program. The process has been simplified to decrease running time, but the cost of the simplifications in sensitivity and specificity is unknown.

- The comparison of techniques depends on having a viable means of simulating data. While we can assess the performance of the model in historical data, a much more precise understanding of its characteristics in possible future situations is highly desirable. In order to do this, we need to build a simulated data set that can be manipulated to mimic these situations.

Activity #2:

The Boston Public Health Commission (BPHC) is currently in the third year of a project funded through this cooperative agreement with the following components:

- Volume based surveillance in Boston EDs
- Monitoring of EMS calls in Boston
- Poison control surveillance
- Mortality rates in Boston and unusual causes of death

Objectives

- The continued development and evaluation of syndromic surveillance for the early detection of BT events.
- The utilization of untapped sources of data for infectious disease surveillance purposes by developing linkages to new data sources, systems and partners, such as ICD-9 data and poison control center data.
- The development of standard case definitions for respiratory or influenza-like illness and other syndromes that may represent possible BT activity and to develop guidelines for differentiating BT events from natural occurrences.
    - In conjunction with the Surveillance Task Force, the BPHC will establish definitions of syndromes listed on the Initial Assessment form to help ensure consistency of diagnoses across sites for follow-up. Baseline frequency for syndromes will be calculated based on ICD-9 data already collected and compared with daily syndromes seen in chief complaint logs. The automatic paging system will be implemented once SFTP to new secure server is finalized at all sites.
- The continued development of a computerized system to assess baseline rates and significant deviations from these rates for ED visits and UCC visits.
    - Baseline data collection at 9 acute care hospitals and one Veteran's Administration (VA) hospital has been completed. BPHC has also collected baseline data from one 24 hr Urgent Care (UC) facility at a local community health center (CHC) and thresholds have been set. BPHC will finalize thresholds for the VA. This site is finalizing procedures to begin sending data using SFTP. Software consultants will continue working with each health care facility to maintain electronic linkages between each site and the BPHC using SFTP. BPHC will continue working with sites to establish daily collection of volume data using SFTP. Weekend and holiday follow-up coverage will be transferred from BPHC program to EMS once all sites have transferred over to SFTP.
- The development of an electronic system to allow real time monitoring of EMS calls, including temporal and geographical clustering patterns.
    - A system will be established to collect EMS call volume on a daily basis. Monthly baseline rates (based on CY 1999 and CY2000 data) for specific EMS call codes have been completed and used to adjust for seasonal variability. Thresholds will be established. BPHC will work with EMS to identify the process required to receive daily electronic data via SFTP and will provide additional necessary programming to carry this out.
- To develop a system for timely identification of increases in mortality and unusual causes of death.
    - Project staff will review death certificates for unusual causes of death. Clinical information will be collected for selected cases and compared to reported cause of death on death certificate to determine the validity of death certificate data. Death certificates for unusual causes of death and deaths in unusual populations will be reviewed. Statistical tools will be used to quantify misclassification of data. BPHC will continue to explore methods for daily electronic transfer of mortality data to the surveillance system.
- To perform expanded surveillance for specific pathogens using remote sensing and geographic information systems coupled with "traditional" surveillance systems to identify clusters in space and time.
    - This project will link with water surveillance activities already underway at BPHC to explore and map cases of waterborne illness in Boston. BPHC has purchased GIS software and BPHC will work with mapping consultants to couple traditional surveillance with GIS to identify cluster patterns. If patterns are noted, advanced molecular testing to confirm a cluster of related cases will be requested, and Special Activities staff will conduct in-depth follow-up investigation of the cases (see proposal for syndromic surveillance under supplemental activities below).
- To explore the feasibility of developing a system of syndromic reporting at sentinel surveillance sites in Boston as a supplement to volume based surveillance in Boston.
    - BPHC will finalize ICD-9 data baselines for 8 hospitals and examine these data as a supplement for volume based surveillance (see objective 1 above). ICD-9 data relates to diagnoses data at the specific surveillance sites. In addition BPHC proposes piloting a syndromic surveillance system at 4 hospital sites and the Health Care for the Homeless program using electronic chief complaint data (see proposal for syndromic surveillance under supplemental activities below).
- To assess the feasibility of using data from a well-established poison control system to supplement volume data from health care facilities in Boston.

- BPHC will continue review of daily electronic data from the poison control center (PCC). Volume compared to threshold will be mapped as part of the web mapping report.

Monitoring and Evaluation: The above objectives will be met if:

By 10/1/2002:

- Programming completed for transfer of daily electronic EMS call code data to BT Surveillance System using SFTP.
- ICD-9 data has been collected at remaining sites.
- All sites are sending data using SFTP (in place of FTP).
- Thresholds based on 2001 data have been set for PCC.
- GIS web mapping design phase has been completed.

By 12/1/2002:

- Automatic alert system implemented.
- Implemented process for daily collection of death certificate data.
- GIS web mapping component developed and pilot testing completed.
- Final analysis of all ICD-9 data has been completed and baseline data set.

By 2/1/2003:

- Implement GIS web mapping component
- Schedule of sites to receive lecture on smallpox has been established.
- Sites identified for refresher bioterrorism lecture.
- Design follow-up protocol using baseline ICD-9 data.
- Develop design phase for using GIS to identify disease clusters.

By 6/1/2003:

- Implement testing of disease cluster identification using GIS.
- The website for infectious disease reporting is established and in use.
- All sites can access feedback on citywide volume levels using the mapping report component.
- Daily data collection using FTP is established at all sites.

By 8/1/2003:

- GIS is routinely used at BPHC for identifying disease clusters.
- Volume based surveillance is linked to syndromic surveillance (based on retrospective ICD-9 data).

Activity #3:

The extension of the Boston Public Health Commission (BPHC) model of volume-based surveillance to the greater Boston area.

Overview: To help meet the threat of bioterrorism, the Cambridge Department of Public Health (CDPH) has joined with the BPHC in installing the Emergency Room Surveillance Program to area hospitals. This program seeks to detect possible BT events by tracking hospital emergency room utilization and flagging any unexpected spikes in volume. Boston has instituted this program in 11 facilities and CDPH proposes to add 5 additional sites taking responsibility for monitoring the system once it becomes operational. The 5 proposed sites are Cambridge Hospital, Somerville Hospital, Whidden Memorial, Mount Auburn and Newton-Wellesley.

Should a hospital's activities exceed expected volumes, the CDPH will be notified and its staff will work with the ED in determining the existence of a possible BT event. It is believed that this system will provide the community with a viable early warning system. The system has proven to be effective in Boston, requiring few resources or time on the part of the participating institutions.

When an ED's activity exceeds expected volumes, the system will initiate a series of communications between the Hospital and CPHD. The discussion will be between the designated ED attending and a public health team comprised of an epidemiologist, an ID clinician and Public Health Nursing. This communication is governed by a series of increasingly more complex forms.

*Initial form***:** is a very brief encounter form that the system generates electronically at the site in the event that volumes exceed expected levels. This form is directed to the ED attending and asks, "is this explainable for reasons other than BT?" If the reasons are benign, the discussion will end. If, however, the reasons appear to be associated with an unexpected number of disease clusters, then a member of the ED staff will be asked to fill out the Short Form. The CPHD is particularly interested in those disease clusters that are related to possible BT events such as gastro-intestinal, neuro-muscular or febrile/ respiratory.

Short Form: The short form is 1.5 pages and asks the ED staff to identify the nature of what occurred during the possible event. If a terrorist event cannot be ruled out, the next step will be for the CPHD to initiate the Long Form.

Long Form: The long form seeks to rapidly obtain epidemiological information about each of the identified patients. It is more labor intensive than the other forms and its completion will be the responsibility of Cambridge Public Health Nursing.

Should the results of this series of investigations point to a BT event, then Local, State and Federal authorities will be notified and the appropriate bio-terrorist response plan will be initiated.

Activity #4:

Development of a statewide pediatric, emergency department-based, syndromic surveillance system for the early detection of bioterrorism events.

Children can be particularly vulnerable during a BT attack. Specialized surveillance systems would ensure the early detection of pediatric victims. Hospital-based BT surveillance systems that rely on combined pediatric and adult data are likely to be insensitive to important patterns of child casualties. Children's Hospital Boston (CHB) provides over 60% of the emergency care to children in Boston, thereby making it a unique site for monitoring surveillance data. CHB has developed a mathematically advanced working prototype of a syndromic surveillance system that is based on ED chief complaints (available online within minutes of a patient's arrival to the ED) and diagnostic coding (available within hours to days).

During the first year of the proposed work, CHB will build a production grade version of this system to establish a reliable linkage, with real time information flow between two hospitals and the MDPH. The system will detect surges in patients presenting with respiratory syndromes to EDs, relying on patterns in time (day and season of visit) and in space (home address). In subsequent years, additional hospitals across the State will be integrated into the network.

Objectives

- Fully automate the data collection system at CHB. The goal is to develop a system requiring minimum human intervention to collect, manipulate, analyze, and visualize the data.
- Fully automate the data collection at the Beth Israel Deaconess Medical Center (BIDMC).
- Adjust data for periodic cycles based on historical and recent patterns. Both CHB and BIDMC have many years of electronic data and typical daily and weekly patterns of patient volume can be assessed using knowledge of values from previous years. In preliminary work, it has been necessary to adjust for periodicity. Day of week and time of year both affect our expected values of patient volume. The use of autoregressive statistical methods allows us to adjust for the effects of both past and recent trends.
- Implement scalable privacy protection for home address data that will be geocoded to yield latitude and longitude coordinates. Only duly authorized individuals will have access to detailed patient location data. However, general summary reports, blurred to the resolution of the census tract, will made available to a wider community of authorized users.
- Detect geographical clusters of disease by adjusting the data for population density and regional utilization patterns. Our simulations thus far have shown our system to be able to detect even very small (N=8) clusters of localized disease outbreaks using the geocoded home addresses of the patient population.
- Generate a continuously updated, web-based display, continuously accessible to MDPH and local health officials. Health officials, who duly authenticate themselves to the website will have access to maps, charts, and summary reports.
- Generate a daily electronic summary report in a standardized and sharable format for MDPH and local health officials. The report will summarize activity over the past day, week, and month as well as provide historical context for interpretation.
- Develop an alerting strategy for MDPH officials. While reports will always be accessible over the web, thresholds are needed to generate special alerts when ED visit patterns are abnormal. A utility model accounting for the adverse effects of both false alarms and missed outbreaks will be constructed and ROC curves generated.
- Conduct an assessment of the information systems at other hospitals. The CHB informatics group will assess, at each institution, 1) which data elements are collected; 2) which data elements are available electronically; 3) what the time latencies are in the data availability; 3) what the data formats are. Agreements are currently in place from Tufts New England Medical Center, Framingham Union Metrowest, South Shore Hospital, Beth Israel Deaconess Hospital, Deaconess Nashoba Hospital, The University of Massachusetts Medical Center, Winchester Hospital, and Beverly Hospital.

Monitoring and Evaluation: This objective will be met if

- By month 4, an assessment of information systems at least four additional hospitals has been completed.
- By month 6, the data collection processes at CHB are fully automated
- By month 8, the data collection processes at Beth Israel Deaconess Hospital are fully automated.
- By month 9, initial work has been performed to integrate one or two more sites into the system
- By month 10, Mass DPH officials can access, over the web, a secure report of daily, weekly, and monthly activity
- By month 12, an automated alerting strategy is implemented.
- System performance will be also be rigorously evaluated using simulated outbreaks, as well as measuring the power for detection of known biological events such as influenza epidemics.

Activity #5:
Use of multiple delivery systems serving overlapping populations for surveillance of acute health events.

Investigators at the Harvard Medical School and Harvard School of Public Health will integrate the signal detection and reporting capabilities of existing separate real-time systems for identifying unusual clusters of BT and other acute health events, and also to improve the efficiency of reporting to the MDPH. This reporting capability will be re-usable indefinitely, and it will allow addition of other reporting entities as new clinical sites with informative data become available for public health surveillance.

The existing systems whose data will be employed for this activity use ambulatory visits at HVMA and at the EDs of Children's Hospital and the Beth Israel deaconess Medical Center. This work will maximize the utility of the information within each system, while preserving the patients' confidentiality and the institutions' proprietary data. It will also test several different methods for detecting clusters within the two systems. This work is expected to provide a method for combining these, and potentially other, separate data sources in the Eastern Massachusetts area into an integrated real-time surveillance system capable of identifying unusual clusters of illness caused by bioterrorism or other agents.

Objective

- Aggregate and analyze data from clinically and administratively separate, but geographically overlapping, real-time automated public health surveillance.

The fundamental aim of the project is to improve the ability to detect changes in the incidence of potential BT-related syndrome episodes in the population of metropolitan Boston. Since two existing data collection systems currently provide information about the same kinds of episodes in two very different health care settings, some combination of the two data streams may provide a more sensitive view of the events that both systems are currently monitoring.

Investigators at the Harvard Medical School DACP with HVMA, and Children's Hospital Boston (CHB) with and the Harvard School of Public Health have developed separate real-time automated surveillance systems for identifying clusters of acute illness in the greater Boston area. The data source for the former is ambulatory visits and telephone calls by HVMA patients who are members of HPHC. The Children's Hospital system assesses visits to the Children's Hospital ED as well as the Beth Israel Deaconess ED.

Both populations reside principally in the greater Boston area. Although the populations have almost complete geographic overlap, and approximately 10% of CHB patients are health plan members, the information provided by these systems is almost entirely complementary. The health plan data tend to have highest volumes on the weekdays, while the ED data tend to have highest volume on weekends. The health plan data comprises a larger number of lower acuity events and includes both adults and children. The ED data includes visits with a range of severity but an overall higher acuity than the health plan. Additionally, CHB provides such care for 60% of children in the Boston area, and could have a special capacity to identify illness clusters that principally affect children.

CHB investigators, in collaboration with investigators at the Harvard School of Public Health, have developed signal detection algorithms to identify clusters of disease using both temporal (ARIMA time series analysis) and novel spatial analytic methods. The DACP team has developed a Generalized Linear Mixed Model which models counts within each census area over time.

We expect that this work will have direct application for development of national public health information infrastructure based on the coalescence of information from the patchwork of regional surveillance systems currently under development.

Methods:
The main approach of the of the project is to compare detection sensitivity under these conditions:

- **Separate data.** The DACP and Children's Hospital data streams used separately and independently to trigger alarm thresholds.
- **Integrated Signal.** The signals from the processed ED and health plan data are used together to define alarm thresholds.
- **Integrated Data.** The ED and health plan cases are integrated into a single stream and then processed and analyzed. The minimum amount of data will be identified that must be integrated in order to be analyzed.

The tasks are:

- Develop a standard data format, compliant with established international standards, for sharing data and of signal across surveillance systems.
- Establish, for each data source separately, thresholds for alarms that result in urgent notification of Mass DPH leadership.
- Establish the normal, baseline distribution of the integrated datasets with respect to the DACP and CHB methods.
- Retrain the models developed by each group (Generalized Linear Models, time series, spatial cluster detection) on the integrated dataset.

- Using receiver operator curves, measure the performance of algorithms in terms of sensitivity and specificity, under the three conditions: separate data, integrated data, integrated signal.

Monitoring and Evaluation: The objective of this project will be met if by 8/30/2003 the following are achieved:

- Formal comparison of three methods of analysis of encounter level data arising from the two types of care settings.
- Assessment of relative analytic efficiencies of three methods of integration (separate signal, integrated signal, integrated data).
- Specification of needs and processes for developing and implementing a combined surveillance system, capable of accommodating information from these clinical systems, plus others.